CHAPTER XI

XI FEASIBILITY OF PRESERVATION ACTIONS

A. Introduction

The Mendums Pond Phase I Diagnostic/Feasibility Project was designed to determine additional knowledge on the effects of shoreline development where relatively little development had occurred. The new development on the lakeshore of Mendums Pond was to be evaluated for its contribution of phosphorus, minerals, metals and sedimentation to Mendums Pond. Research interests that were to be addressed in the project included lake quality effects of land clearing, surface water runoff, erosional processes, leachfield effectiveness for phosphorus retention, landscaping and people pressure.

The project began at the peak development stage in New Hampshire. The economy was booming and shoreland development was occurring throughout the state at a record pace. At the end of the project's first year, the economy became sluggish and people were more apprehensive about buying into costly shoreland property. The proposed plan which called for the development of the entire western shoreline with 18 to 20 single family lots never reached its potential. Four years later, only four of the lots have been developed.

Because development never reached its potential at this site, the Diagnostic Study took place during a period of low to moderate lakeshore development instead of an anticipated moderate to high development scenario. Therefore, the full effects of the proposed development on Mendums Pond could not be measured. However, three years of intensive tributary and lake monitoring have been completed and will serve as valuable background to what level the lake was at during low development stages.

The Diagnostic Project identified the sources of phosphorus to the pond and discovered the limitations of the surrounding soils to attenuate septic leachate phosphorus. The Feasibility section for Mendums Pond focus more attention on watershed management and lake protection and less attention to lake restoration.

B. Overview

The subject of lake restoration and lake protection has been debated and researched extensively in the past decade. Although the need to do something about our degraded lakes is beyond dispute, the science of lake restoration is still in its infancy. Often, a judgement must be made about feasible limits of expenditure and effort without the reassurance of a solid basis for predicting results.

Once a project for lake restoration or watershed protection is undertaken, the results of this effort must be carefully monitored, evaluated and recorded.

Lakes differ biologically, chemically, and physically, so that one method may bring gratifying results in one lake and not in another. Permanent lake rehabilitation begins with halting the introduction of undesirable substances.

Most successful lake restoration and watershed management projects are easily appreciated by people familiar with the "before". A lake restored to health and beauty is an irresistibly exhilarating sight.

The previous sections of this report constitute a diagnostic study of Mendums Pond. They describe the water quality problems and the sources and levels of the nutrients causing those problems. This section deals with the feasibility of implementing a variety of techniques to help reduce the problems that do exist and to protect the lake in the future.

Techniques available for lake restoration and protection are commonly grouped into two basic types: those that attack the cause of the problem and those that attempt to mitigate the effects of the problem. While both approaches may sometimes have to be utilized, those that attack the cause of the problem are the only long-term solutions.

C. Lake Restoration

Lake restoration techniques are grouped as problem treatment and cause treatment. Because this Feasibility Study focuses on watershed management and lake protection, no detailed feasibility methodology on lake restoration techniques are included in this section. A detailed explanation on lake restoration techniques can be found in other diagnostic/feasibility studies completed by this department.

Problem treatments include algaecide treatment, artificial circulation and hypolimnetic aeration. Cause treatments include sediment removal, phosphorus inactivation, dilution and flushing, sediment oxidation and biomanipulation.

D. Watershed Management

1. Introduction

The implementation of proper watershed management techniques within the Mendums Pond Watershed will mitigate the potential decline in the future from population growth in water quality throughout the study area. Continued population growth and the associated growth in residential and commercial development, the continuing pressures from seasonal home development and conversion, and an increase in recreational use, combine to place a burden on the surface water resources within the region. Watershed management techniques designed to reduce this pressure include a variety of land use, land management and wetlands management techniques.

Each of these groups of management techniques plays a major role in the preservation of lake quality levels within the watershed. The existing condition of the lake, and the nutrient supply sources identified by the study clearly point out the need to eliminate or reduce those factors that might contribute to the decline in lake quality. While it is not possible to place specific values on each management practice in terms of potential reduced loads, it is clear that these practices, taken individually or in combination, will help to ensure that future development will be conducted in a manner which does not accelerate the decline in lake quality.

2. Phosphorus Attenuation Utilizing Wetland Management

Most studies examining water quality changes in temperate wetlands found distinct seasonal variations in wetland attenuation of phosphorus. Although these variations were generally marked by minimum attenuation or even release of phosphorus during the fall and spring high flows, the specific conditions at any particular site may alter this seasonal pattern. Several studies indicated that wetlands were net accumulators of phosphorus on an annual basis, and may have maximum seasonal removal efficiencies from 80 to 98 percent during the summer growing season. This seasonal attenuation of phosphorus by the wetlands may be significant inasmuch as it may delay the entry of nutrients into downstream water bodies until the fall, winter, or in some cases, spring, when their impact may be less severe (Lee et. al., 1975).

Bentley (1969) studied four wetlands in Wisconsin and estimated that on a long-term basis, they were neither nutrient sources nor sinks, but that the

marshes tended to accumulate nutrients during the growing season and release them during spring runoff. However, even during periods of active photosynthesis, the wetlands were not a barrier to nutrient transport.

A study on the Chadwick Meadows wetland in North Sutton, NH, demonstrated that newly created wetland areas may act for many years as a phosphorus source, rather than a phosphorus sink. Flooded in 1983, Chadwick Meadows has yet to provide the theorized phosphorus reduction in tributary loading to Kezar Lake (Connor and Martin, 1986).

Richardson (1988) examined the ecological value of wetlands in terms of the ability to filter materials, transform nutrients, or function as sources or sinks. Macrophytes are mainly responsible for the recycling of phosphorus through root uptake from the soil; plants are the source of phosphorus for the water rather than the reverse. Richardson concluded that wetlands are incorrectly depicted as sinks when, in fact, they should be recognized as transformers. Wetlands with organic soils do not retain phosphorus as efficiently as forested systems and are often a source of nutrients rather than a sink for them.

In addition to incorporating nutrients into plant tissue, marshes also serve to settle out a large portion of the suspended particulate materials and to remove nitrogen through dentrification reactions. On the other hand, the periodic occurrence of anaerobic conditions increases the possibility for discharge of ammonia and soluble inorganic phosphorus, particularly in wetlands subject to pulses of high discharge from runoff.

Although there are several wetlands within the Mendums Pond watershed that may presently be attenuating phosphorus, wetlands management engineering and biological studies were beyond the scope of this project. The merits of wetlands management as a feasible phosphorus attenuation program for Mendums Pond would have to be evaluated in greater detail before this technique could be utilized. Additional site specific studies on phosphorus attenuation rates, trophic response models, engineering designs, and cost benefits must all be evaluated, which in itself may be quite expensive.

3. Shoreland and Watershed Protection

Reasonable and appropriate regulations can be an important part of a watershed-lake protection and management plan. These regulations can be adopted for three general purposes: (1) protecting the lake by regulating watershed activities that cause erosion and pollution problems; (2)

controlling development to protect the aesthetics and benefits of the shoreland; and (3) regulating the lake usage to reduce conflicts among swimmers, boaters, fishermen, and others (Born and Yanggen, 1972). Some of the most serious lake problems occur because of conflicts among lake users.

a. Controlled Development

Many of the same regulatory activities developed for other situations such as urban areas can be adapted to protect or maintain lake quality. Zoning, for example, was developed to minimize conflicts between potentially incompatible land uses such as heavy industry commercial areas and residential homes in urban areas. Zoning also can be used to protect lake quality. Setback zones or areas typically are used to protect highway corridors. Setback regulations for piers, boathouses, wharves, and homes can help preserve shore cover, vegetation, and aesthetics. Some lake communities have a minimum setback of 75 to 100 feet for all buildings, including homes.

A variety of zoning techniques are available for lake management and protection; some are listed in Table XI-1. Many of these procedures were summarized by Public Technology, Inc. (1977), in its report on land management.

Some communities protect lakes with regulations and ordinances that require best management practices (BMPs) for existing uses and planned development of the lakeside community. Construction should be regulated to minimize nonpoint source pollution.

Planned development of the lake's watershed is an effective means of minimizing lake problems while maintaining economic growth in the community. Subdivision regulations including minimum lot sizes, minimum frontage requirements, minimum floor area, height restrictions, and land use intensity ratings also are applicable for lakefront property of the community around a lake. Several development approaches are listed in Table XI-2. Planned unit developments that are clustered can be combined with special protection, critical, or environmentally sensitive area designations to provide lots and homes for people in a lake environment and setting while avoiding direct pollution of lakes, and protecting important environmental resources of unique aquatic habitats. Clustered developments allow greater flexibility in arranging lots and use more economical and efficient small-scale water systems and waste treatment systems.

Table XI-1

A variety of zoning techniques

TOPIC	DEFINITION
Zoning	The regulation of building types, densities, and uses permitted in districts established by law.
Special Permits/ Special Exceptions/ Conditional Use Permits	Administrative permits for uses that are generally compatible with a particular use zone, but that are permitted only if certain specified standards and conditions are met.
Variances	Administrative permits for uses that are generally compatible with a particular use zone, but that are permitted only if certain specified standards and conditions are met.
Floating Zones	Use zones established in the text of a zoning ordinance, mapped until a developer proposes and the legislative body adopts such a zone for a particular site.
Conditional Zoning	An arrangement whereby a jurisdiction extracts promises to limit the future use of land, dedicate property, or meet any other conditions. The arrangement is either stated in general terms in the zoning ordinance or imposed on a case-by-case basis by the legislative or administrative body, prior to considering a request for a rezoning.
Contract Zoning	An arrangement whereby a jurisdiction agrees to rezone specified land parcels subject to the landowner's execution of restrictive covenants or other restrictions to dedicate property or meet other conditions stated in the zoning ordinance or imposed by the legislative or administrative body.
Cyclical Rezoning	The periodic, concurrent consideration of all pending rezoning applications, generally as part of an ongoing rezoning program, focusing upon one district at a time.
Comprehensive Plan Consistency Requirement	Provisions that require all zoning actions, and all other government actions authorizing development, be consistent with an independently adopted comprehensive plan.

Zoning Referendum	Ratification of legislatively approved land use changes before such changes become law.
Prohibitory Zoning	The exclusion of all multifamily, mobile, modular, industrialized, prefabricated, or other "undesirable" housing types from an entire jurisdiction, or from most of the jurisdiction.
Agricultural Zoning/Large Lot Zoning/Open Space Zoning	The establishment of "permanent" zones with large (that is multiacre) minimum lot sizes and/or a prohibition against all nonagricultural development (with the exception of single-family residences and, possibly, selected other uses).
Phased Zoning/ Holding Zones/ Short-Term Service Area	The division of an area into (1) temporary holding zones closed to most nonagricultural uses and/or with large minimum lot sizes, and (2) service areas provided with urban services and open for development in the near term (for example 5 years).
Performance Zoning/Performance Standards	An arrangement whereby all or selected uses are permitted in a district if they are in compliance with stated performance standards; that is, if they meet stated community and environmental criteria on pollution, hazards, public service demands, etc.
Flexible Zoning/ Cluster Zoning/ Density Zoning	Freedom from minimum lot size, width, and yardage regulations, enabling a developer to distribute dwelling units over individual lots in any manner the developer desires, provided (usually) that the overall density of the entire subdivision remains constant.

From the Lake and Reservoir Restoration Guidance Manual, Second Edition, EPA, 1990.

Table XI-2
Development Approaches

TOPIC	DEFINITION
Planned Unit Development (PUD)	A conditional use of floating zone regulated through specific design standards and performance criteria, rather than through the traditional lot-by-lot approach of conventional subdivision and zoning controls.
Subdivision Regulations	Procedures for regulating the division of one parcel of land into two or more parcels - usually including a site plan review, exactions, and the application of aesthetic, bulk, and public facility design standards.
Minimum Lot Size	The prohibition of development on lots below a minimum size.
Minimum Lot Size Per Dwelling Lot	A limitation on the maximum number of dwelling units permitted on a lot, based on the land area of that lot (usually applied to multifamily housing).
Minimum Lot Size Per Room	A limitation on the maximum number of rooms (or bedrooms) permitted on a lot, based on the land area of that lot (usually applied to multifamily housing).
Setback, Frontage, and Yard Regulations	The prohibition of development on lots without minimum front, rear, or side yards or below a minimum width.
Minimum Floor Area	The prohibition of development below a minimum building size.
Height Restriction	The prohibition of development above a maximum height.
Floor Area Ratio (FAR)	The maximum square footage of total floor area permitted for each square foot of land area.
Land Use Intensity Rating	Regulations that limit the maximum amount of permitted floor space and require a minimum amount of open space (excluding parking areas) and recreation space, and a minimum number of parking spaces (total and spaces reserved for residents only).
Adequate Public Facilities Ordinance	The withholding of development permission whenever adequate public facilities and services, and defined by ordinance, are lacking unless the facilities and services are supplied by the developer.
Permit Allocation System	The periodic allocation of a restricted (maximum) number of building permits or other development permits first to individual districts within a jurisdiction and then to particular development proposals.

Table XI-2
A variety of zoning techniques

TOPIC	DEFINITION
Facility Allocation System	The periodic allocation of existing capacity in public facilities, especially in sewer and water lines and arterial roads, to areas where development is desired while avoiding areas where development is not desired.
Development Moratorium/ Interim Development Controls	A temporary restriction of development through the denial of building permits, rezonings, water and sewer connections, or other development permits until planning is completed and permanent controls and incentives are adopted, or until the capacity of critically overburdened public facilities is expanded.
Special Protection Districts/ Critical Areas/ Environmentally Sensitive Areas	Areas of local, regional, or State-wide importance- critical environmental areas (for example, wetlands and shorelands with steep slopes); areas with high potential for natural disaster (for example, floodplains and earthquake zones); and areas of social importance (for example, historical, archaeological, and institutional districts) - protected by a special development review and approval process, sometimes involving State-approved regulations.

From the Lake and Reservoir Restoration Guidance Manual, Second Edition, EPA, 1990.

b. Land Mangement Recommendations for Barrington

i. Master Plan

The Town of Barrington has a master plan that was developed in 1980. The town is now in the process of updating the master plan. These plans and the planning process basis are important expressions of community desires for guiding future land use in Barrington. As conditions change, it is important to reassess and revise the goals and policies. Legally, there are important reasons for maintaining a current master plan, since it serves as the basis for land use regulations and capital improvement programs for the town.

Watershed communities should review and update their master plans on a periodic basis. Every five years is recommended by RSA 674:2 VIII for local water resources management and protection plans.

ii Local Water Resources Management and Protection Plans

In 1986, the legislature established the Water Protection Assistance Program within the Office of State Planning (RSA 4-C:19). The purpose of the program is to encourage municipalities to evaluate their water resources and to develop measures for the protection of both groundwater and surface water. The statute directed OSP to develop administrative rules to provide guidance for municipalities in the development of local water resources management and protection plans, to be adopted as part of the conservation and preservation section of their master plans. The original rules took effect on January 20, 1988. Subsequent revisions to the rules were made on August 20, 1990, to simplify and add flexibility to the planning process. According to the rules, a local water plan should provide a descriptive evaluation of a municipality's watersheds to include wetlands, floodplains, lakes, ponds, rivers and perennial streams. Groundwater resources within the town should also be evaluated, to include bedrock as well as stratified drift aquifers. The water plan should identify potential threats to water resources and project the municipality's future need for these resources. After providing an analysis of the town's existing regulatory framework, the plan should present a strategy of both regulatory and non-regulatory mechanisms for the

long term mangement and protection of the town's water resources. A local waterplan must be submitted to OSP for review and written comment relative to its consistency with the State rules, prior to local adoption.

Barrington should enter into a formal cooperatrive effort to prepare a regional water resource management and protection plan that is consistent between municipalities. The Planning board should adopt the portion of that plan that pertains to their municipality as part of the conservation and preservation section of their master plans (RSA 674:2, VIII).

iii. Local Regulatory Measures

- Zoning

The purpose of a zoning ordinance is to regulate the use of land in a manner that promotes the health and welfare of a municipality. It should include requirements to lessen congestion in the streets, secure safety from fires, panic and other dangers, to provide adequate light and air, to prevent the overcrowding of land and to avoid undue concentrations of populations. The ordinance should be designed to facilitate adequate provision of an infrastructure to meet municipal needs for such services as transportation, solid waste facilities, water, sewerage, schools and parks.

RSA 674:16 authorizes the local legislative body of a city or town to adopt and amend a zoning ordinance for the purpose of promoting the health, safety or general welfare of the community. Such ordinances are designed to regulate and restrict the use of land within the municipality. They often include maximum limitations for the density, height, number of stories and sizes of buildings and other structures. They specify areas, or zones, within the municipality where land and structures can be used for business, industrial, residential and other purposes. A listing of land uses that are permitted and prohibited, or permitted by special exception, is usually included for each zone within the community.

- Environmental Characteristics Zoning

It is common for municipalities to recognize the importance of critical resource areas by adding protective overlay districts to their townwide zoning ordinances. An overlay zone is so called because it adds special protective requirements or higher standards within an area that is delineated as a special resource. The boundaries of that resource usually do not coincide with those of the regular zoning districts. Where the requirements of the districts differ, the more stringent of the two apply. This type of zoning has traditionally been used to protect wetlands, floodplains, watersheds, aquifers, steep slopes and shorelines. Table XI-3 presents a summary of the types of requirements that are likely to be found in overlay zoning ordinances to address these resources.

Delineation of the environmental overlay zoning districts usually depends upon existing maps and data prepared by federal agencies such as the Soil Conservation Service, United States Geological Survey, Federal Emergency Management Agency and others. Although such maps provide the planning board with a general idea of the extent of the resource in question, they are generally not sufficient in detail to identify a precise location of the district boundary. Where this is the case, it is important for the overlay zoning ordinance to allow applicants to provide the planning board with more technical, site specific information to delineate the boundary. It is helpful to both the planning board and applicants if that section of the ordinance clearly defines the methodology or options for methodologies to be used to delineate the district in the field. The ordinance may provide for an independent review of the data which has been provided by the applicant, or by a qualified consultant hired by the planning board at the applicant's expense. This type of review and professional consultation assists the planning board in making an informed decision based on technical information about the sensitive resource that the ordinance aims to protect. The ordinance may also spell out conditions under which the planning board may require site specific investigations.

Barrington should adopt requirements in their zoning ordinances to allow applicants to provide, and planning boards to require, site specific information as part of the local review process for environmental overlay zones.

Table XI-3

Overlay Zoning Techniques: Key Characteristics

Wetlands	Floodplains	Watershed
- Permitted and prohibited uses*	- Permitted and prohibited uses*	- Permitted and prohibited uses*
- Setbacks for septic tanks/ leachfields*	- Setbacks for septic tanks/leachfields*	- Performance standards more stringent than generally required by zoning*
- Setbacks for roads and structures*	- Setbacks for wells, structures, roads*	- Site specific data requirement option
- Buffers*	- Zero increase in peak flood elevation	
- Definition of wetlands and methodology for their delineation*	- Site specific data option	
- Site specific data requirement option		

Aquifer	Steep Slopes	Shoreline
- Permitted and prohibited uses*	- Requirements for location or prohibition of septic systems vs. roads and structures*	- Buffers, setbacks and rationale*
- Definition and methodology for delineation of district*	- Site specific data requirement option	- BMP's for lawn management natural vegetative buffers, etc.*
- More stringent performance standards than required by site review*		- Requirements for shoreline structures*
- More stringent performance standards than watershed*		- Site specific data requirement option

Table XI-3

Overlay Zoning Techniques: Key Characteristics (continued)

	Aquifer
- Limitations or percent coverage by impervious materials*	
- Site specific data requirement option	

Note: * Need to examine scientific basis.

Source: NH Office of State Planning, Water Protection Assistance Program, 1990.

• Wetlands Zoning

Many municipalities adopt wetlands overlay zoning regulations to protect the natural functions or values which make wetlands critical resources within a watershed. These important functions include flood protection and flow stabilization, wildlife habitat, filtration of nutrients, trapping of sediments, and ecological productivity. Such ordinances need to define or delineate the extent of the overlay district boundary. There are a number of different ways of establishing the extent of wetland boundaries, the most commonly used criteria being soils, vegetation, and hydrology. Wetland overlay ordinances typically have requirements for setbacks from wetlands for the location of septic system tanks and leachfields, roads and structures. Some ordinances establish buffers around wetlands within which land uses are either restricted or required to adhere to performance standards. It is common for wetland ordinances to allow the planning board to require that site specific information relative to the location of the wetland boundary be supplied by the applicant. This is usually reserved for sites where considerable acreage of wetlands is proposed for alteration, or the wetlands exhibit particular resource values that are of significance to the municipality.

The Town of Barrington has implemented a Wetland Conservation District. The following description is from article 16 of the Barrington Zoning Ordinance of 1972.

16.A. GENERAL:

16.A.1. The Wetland Conservation District is hereby determined to be those areas identified and delineated as poorly drained or very poorly drained soils and as bodies of water by the Strafford County Soil Survey through field mapping surveys and shown on its field mapping photographic sheets for the Town of Barrington, New Hampshire. The Wetland Conservation District as herein defined is shown on a map or maps designated as the Town of Barrington Wetland Conservation District Map and is part of the Zoning Map of the Town of Barrington, New Hampshire.

16.A.2. The Wetland Conservation District shall be considered as overlaying any other districts established by this ordinance. Any use permitted in the portion of the districts so overlayed shall only be permitted subject to all provisions of this section.

(a) All parcels of land proposed for development, as part of a subdivision, site plan or open space development shall, as part of their submission to the Planning Board, designate poorly drained and very poorly drained soils on their plat or plan at a scale of 1" = 100' or larger. This designation shall be based upon an in-the-field analysis and mapping by a qualified soils scientist acceptable to the Barrington Planning Board. The accuracy of this map shall supersede the county soils maps upon its acceptance by the Planning Board, and the limits of the wetlands shall be revised accordingly.

16.A.3. Purpose:

In the interest of public health, convenience, safety and welfare, the regulations of this district are intended to guide the use of areas of land with extended periods of high water table.

(a) To control building and land uses on naturally occurring wetlands which would contribute to pollution of surface and groundwater by sewage.
(b) To prevent the destruction of natural wetlands which provide flood protection, recharge of groundwater supply and augmentation of stream flow during dry periods.
(c) To prevent unnecessary or excessive expenses to the Town to provide and maintain essential services and utilities which arise because of inharmonious use of wetlands.
(d) To encourage those uses that can be appropriately and safely located in wetland areas.

16.B.

16.B.1. PERMITTED USES:

Any of the following uses, provided they comply with the purposes in 16.A.3. and do not substantially alter the surface configuration of the land.

(a) Forestry - tree farming.
(b) Agriculture, including grazing, farming, truck gardening and harvesting of crops; but not including the stockpiling of manure.

(c) Water improvements and well supplies, public and private.

(d) Drainage ways - streams, creeks or other paths of normal runoff water.

(e) Wildlife refuge.

(f) Parks and such recreational uses as are consistent with the purpose of paragraph 17.A.3.

(g) Conservation areas and nature trails.

(h) Open space as permitted by subdivision regulations and other sections of this ordinance.

(i) Culverts, bridges, docks.

(j) Recreational uses provided they do not generate harmful runoff or would be damaged by flooding.

16.B.2. SPECIAL PROVISIONS:

(a) No septic tank or leach field may be constructed or enlarged closer than seventy-five (75) feet to any wetland.

(b) Poorly drained soils may be used to satisfy minimum lot areas and setback requirements and may be used when applying a residential density factor provided that the portion which is poorly drained does not exceed twenty-five (25) percent of either the minimum required lot area or the gross tract area to which a residential density factor is being applied, and provided that the remaining lot area or gross tract area is sufficient in size and configuration to adequately accommodate all required utilities such as sewage disposal and water supply; for on-site septic tank and leach fields, this shall include both a primary and a secondary leach field location. Bodies of water and very poorly drained soils may not be so used.

The zoning board of adjustment does allow for special exceptions after proper public notice and public hearing - local approval of proposed projects in wetlands are conditional upon approval of state and federal wetlands permits.

The Planning board should be aware of the changes that are occurring in defining the methodologies for wetland delineation at the state and federal levels. Based on these changes, they should reevaluate the effectiveness of the provisions in their existing wetlands ordinances which outline the methodology for delineating the district boundary. Revisions should be proposed where they are determined to be appropriate.

- Floodplain Zoning

Floodplains are sensitive resources that are often protected by local zoning. Their values include their ability to protect adjacent properties from damage by assimilating flood waters during storm events. Many also serve as critical wildlife areas, and either are wetlands or are associated with wetland habitats. Communities are required by the Federal Emergency Management Agency (FEMA) to pass certain minimal zoning restrictions for floodplain development, in order to be eligible for the federal flood insurance program. Many communities choose to adopt floodplain requirements in their zoning ordinances which are more stringent than the minimum required by the FEMA program. The FEMA program allows construction within sensitive floodplain areas if the structures are "floodproofed." Filling in or paving over floodplains decrease the peak flow capacity of the riverine system. The cumulative impacts of filling or paving, over time, can have a significant impact on downstream properties. Municipalities can adopt more stringent overlay zoning requirements than FEMA's, to provide protection measures for floodplain areas. Floodplain ordinances can include setbacks and site specific data requirements that are similar to those found in wetlands ordinances. Requirements for maximum or no increases in peak flood levels are often considered in floodplain zoning ordinances.

Barrington should adopt local floodplain zoning ordinances which are more stringent than the minimum FEMA requirements. The purpose of these ordinances would be to take a resource protection oriented approach to regulating development in floodplains and to decrease the cumulative impacts of the disturbance of these sensitive areas on downstream property owners.

- Watershed Zoning

Some communities have recognized the importance of particular watersheds by adopting watershed protection overlay districts. This is common where there is either a public surface water supply or a particualr watershed contributing recharge to a groundwater supply. It is also common for watershed zoning to be used to protect a surface waterbody that is considered a critical resource for reasons other than drinking water supply. Such ordinances usually specify land uses which are permitted or prohibited within the watershed. With outright prohibition of land uses within an entire watershed, the potential for a "taking" issue may come into play. The emphasis, therefore, is usually on performance standards that are somewhat more specific or stringent than those required for the rest of the community. Such standards should be designed to address protection of the specific resource values for which the watershed is considered locally important. In many instances the land of a significant watershed may lie within a number of municipalities. In these cases it may be appropriate for each community to adopt the same performance standards for the portion of the watershed that is within their town. This is one way to assure consistent protection throughout the entire hydrologic system.

The watershed zoning approach should be considered by the Town of Barrington.

- Aquifer Zoning

There has been an increased interest in local groundwater protection, stemming from a growing pubilc awareness about groundwater contamination occurrences. The State-USGS cooperative aquifer mapping program is making available improved information about stratified sand and gravel aquifers on a statewide basis. In order to protect these areas for future use as potential water supplies, many municipalities have adopted aquifer zoning districts. These ordinances generally list permitted and prohibited uses. To a large extent, they also rely on performance standards for future land uses to minimize the chances of aquifer contamination resulting from new development. Such standards often include provisions that require containment structures for uses involving the presence of dangerous materials. Treatment swales to

control stormwater flows and ensure infiltration for groundwater recharge are also common. Due to their high rates of transmissivity and permeability, aquifer areas that may serve as existing or future water supplies are sensitive to potential pollutants. This is generally considered to be justification for more stringent performance standards than are imposed throughout the municipality.

Barrington is encouraged to adopt aquifer protection overlay districts as part of their zoning ordinances.

The town should consider participation in the emerging state wellhead protection program by undertaking local inventories of potential threats to existing wells and adopting local protection measures to manage activities in wellhead areas.

- Steep Slopes Zoning

Steep slopes are quite vulnerable to erosion and subsequent sedimentation of water courses when exposed by disturbance of land and vegetation. For this reason, many communities prohibit the location of roads, structures and septic systems in areas with excessive slopes. Some communities have mapped areas with a slope greater than a certain percentage, and consider these areas as an overlay district. Some simply specify, in the text of the ordinance, that land with greater than a certain percent slope cannot be built upon or used in calculations to fulfill minimum lot size requirements.

The Town of Barrington should consider adoption of steep slope ordinances as a means of providing more explicit guidance to landowners as to the kinds of uses and minimum space standards which can be permitted in these areas.

- Shoreland Zoning

A concern about disturbance of natural shorelands has arisen from the increase in demand for and the value of waterfront property. Devegetated, exposed shorelands are subject to erosion from increased wave action due to storm and boating pressures. Further removal of natural shore vegetation leaves the land vulnerable to storm event related erosion. The installation of lawns along the shore often leads to the introduction of fertilizers and

pesticides. Many municipalities with lake and river shorelands are responding to this concern by developing overlay zoning ordinances that address specific lacustrine (lake) and riverine habitat problems. Consideration is being given to minimum frontage requirements and setbacks from surface waters for septic systems, structures and other alterations of terrain.

Mendums Pond Watershed Protection District.

Most (>90%) of the drainage area of Mendums Pond lies in Barrington. Only a small portion of the watershed lies in Nottingham.

The Town of Barrington has set up a Shoreland Setback District (Town of Barrington Zoning Ordinance, 1972). Article seventeen reads as follows:

SHORELAND SETBACK DISTRICT:

Apart from docks, floats and other structures which are customarily associated with the recreational use of water and which are otherwise in compliance with applicable federal, state and town laws and regulations, no structures of any type, including by way of example and not by way of limitation, all buildings, garages, sheds, parking lots and driveways, may be constructed or located within seventy-five (75) feet of the shore of any year-round stream, lake, pond or other body of water. For the purposes of this ordinance, "shore" shall be defined as the mean high water line of the body of water at the water's edge. Lots of record as of the effective date of this Article are exempt from this particular Article to the extent conformance is impossible. Any structure on such lots must conform as fully as possible.

The Mendums Landing development, however is more restrictive. Although the setback requirements are the same, the Mendums Landing development requires a natural buffer of 50 feet, selective cutting and no other structures except for water recreation.

The Mendum's watershed is zoned agricultural-residential except for Route 4 which is zoned for residential, agricultural and commercial. Routes 4 and 125 are zoned for light industrial.

Much of the Mendums Pond watershed is classified as Zone A. The land uses allowed in Zone A are as follows:

(a) The buying, selling and exposing for sale of home produce and products.

(b) Taking of boarders or the leasing or renting of rooms or buildings.

(c) Home occupations as defined in the "Definitions" section of this Ordinance.

(d) Single-family and/or two-family residences including accessory buildings and buildings for agricultural purposes in this district.

(e) Convalescent and nursing homes, churches, schools, playgrounds, parks, golf courses, tennis courts.

(f) Farming, including dairying, livestock and poultry raisings, horticulture, truck farming, forestry, and other related agricultural enterprises, and the sale of products realized from farming are permitted.

The following setbacks and restrictions for the agricultural-residential district are from the Town of Barrington Zoning Ordinance of 1972:

ARTICLE SEVEN

A. AGRICULTURAL - RESIDENTIAL DISTRICT (ZONE A)

7.A.1. The minimum lot area in an agricultural-residential district shall be 80,000 square feet with an additional 40,000 square feet for each additional one-bedroom dwelling unit under a common roof. For two-family structures, composed of dwellings of units of more than one bedroom each, the minimum lot area in an agricultural-residential district shall be 80,000 square feet with an additional 80,000 square foot requirement for each additional dwelling unit under a common roof.

7.A.2. Every lot shall have a minimum frontage of 200 feet except that lots located on a cul-de-sac shall have a minimum frontage of 100 feet provided that all the frontage is located on the cul-de-sac. Backlots are allowed providing they have 80,000 square feet and are serviced by a right-of-way of 50' not included in the 80,000 square feet requirement.

7.A.3. The minimum street yard requirement for any lot in an agricultural residential district shall be forty (40) feet.

7.A.4. The minimum rear yard requirement for an agricultural-residential district shall be thirty (30) feet.

7.A.5. The minimum side yard requirement for an agricultural-residential district shall be thirty (30) feet.

7.A.6. The minimum setback requirement for a structure, other than a permitted sign, in an agricultural-residential district shall be forty (40) feet.

7.A.7. The maximum coverage in any lot shall be 25% of the total lot area.

7.A.8. The maximum building height to the base of the roof of any building in an agricultural-residential district shall be thirty-five (35) feet, and the maximum number of stories of any building within an agricultural - residential district shall be 2 1/2 stories.

7.A.9. All building lots shall comply with all applicable regulations of the New Hampshire Water Supply and Pollution Control Division prior to the sale of, or construction upon, any such lot.

We recommend that a Lake Protection District be set up by the Town of Barrington. This District is defined as an environmentally sensitive area surrounding the lakes and ponds of Barrington in which development activities must be closely regulated to preserve the lake quality. This protection district should also include each sub-drainage basin to the lake. Since landuse in the lake's watershed land-use is the key to nutrient and sedimentation rates to the lake, more effort must be devoted to this important element. The adoption of a Watershed Protection District would be an improvement over the current district description for solely the lake area. The adoption if the State's Shoreland Protection Act would be a great benefit to protecting the town's waterbodies.

A Shoreland Protection Act was passed by both the Senate and House of Representatives during the 1991 legislative session. With the concern that the protection of this states waterbodies is a primary goal, the general court found:

- The shorelands of the state are among its most valuable and fragile natural resources and that their protection is essential to maintain the integrity of public waters.

- The public waters of New Hampshire are valuable resources held in trust by the state and the state has an interest in preserving those waters and has the jurisdiction to control the use of the public waters and the adjacent shoreland for the greatest public benefit.

- There is great concern throughout the state relating to the utilization, protection, restoration and preservation of shorelands because of their effect on state waters.

- Under current law the potential exists for uncoordinated, unplanned and piecemeal development along the state's shorelines, which could result in significant negative impacts on the public waters of New Hampshire.

To fulfill the state's role as trustee of its waters and to promote public health, safety, and the general welfare, the General Court declared that the public interest requires the establishment of standards for the subdivision, use and development of the shorelands of the state's public waters. The development standards provided in this Chapter shall be the minimum standards necessary to protect the public waters of the State of New Hampshire. These standards shall serve to:

- Further the maintenance of safe and healthful conditions.
- Provide for the wise utilization of water and related land resources.
- Prevent and control water pollution.
- Protect fish spawning grounds, aquatic life, bird and other wildlife habitats.
- Protect buildings and lands from flooding and accelerated erosion.
- Protect archeological and historic resources.
- Protect commercial fishing and maritime industries.
- Protect freshwater and coastal wetlands.
- Control building sites, placement of structures and land uses.
- Conserve shore cover, and visual as well as actual points of access to inland and coastal waters.
- Preserve the state's rivers, lakes, estuaries and coastal waters in their natural state.

- Promote wildlife habitat, scenic beauty, and scientific study.
- Protect public use of waters, including recreation.
- Conserve natural beauty and open spaces.
- Anticipate and respond to the impacts of development in shoreland areas.

The shoreland protection standards were designed to minimize shoreland disturbance so as to protect public waters, while still accommodating reasonable development in the protected shoreland. More stringent standards for the shoreland protection area may be adopted by the local government.

The minimum shoreland protection standards are listed below and summarized on Table XI-4.

Protected Shoreland Restrictions

- Salt storage yards, auto junk yards, and solid or hazardous waste facilities shall be prohibited.
- Primary structures shall be setback behind the primary building line. This line shall require a minimum setback fo 50 feet from the public boundary line.
- Water dependent structures, such as docks, piers, breakwater or other structures, built over, on, or in the state waters shall be constructed only as approved by the wetlands board pursuant to RSA 482A.
- The application of any fertilizer, pesticide or herbicide within 125 feet of the public boundary line for noncommercial private purposes shall be prohibited.
- A natural woodland buffer shall be maintained within 150 feet of the public boundary line to protect the quality of public waters by minimizing erosion, preventing siltation and turbidity, stabilizing soils, and reducing phosphorus loading.
- Septic systems within the protected shoreland are subject to the department's subdivision approval requirements pursuant to RSA 485-A:29 regardless of size.
  The following conditions shall dictate the setback requirements for septic systems:

TABLE XI-4

PROTECTED SHORELAND STANDARDS

LIMITS OF PROTECTED SHORELAND

- Lot size by soil type
- Lot width at 150'
- Alteration of Terrain Permit standards reduced from 100,000 SF to 50,000 SF
- Salt storage yards, auto junk yards, solid waste and hazardous waste facilities prohibited
- Erosion and Siltation Controls

LIMITS OF CUTTING RESTRICTIONS

- 1/2 basal area every 20 years (Duplicates existing Timber Laws)

SEPTIC SYSTEM SETBACKS

- Start at 125'
- Reduce to 75' as conditions permit
- Prohibit fertilizers, pesticides and herbicides

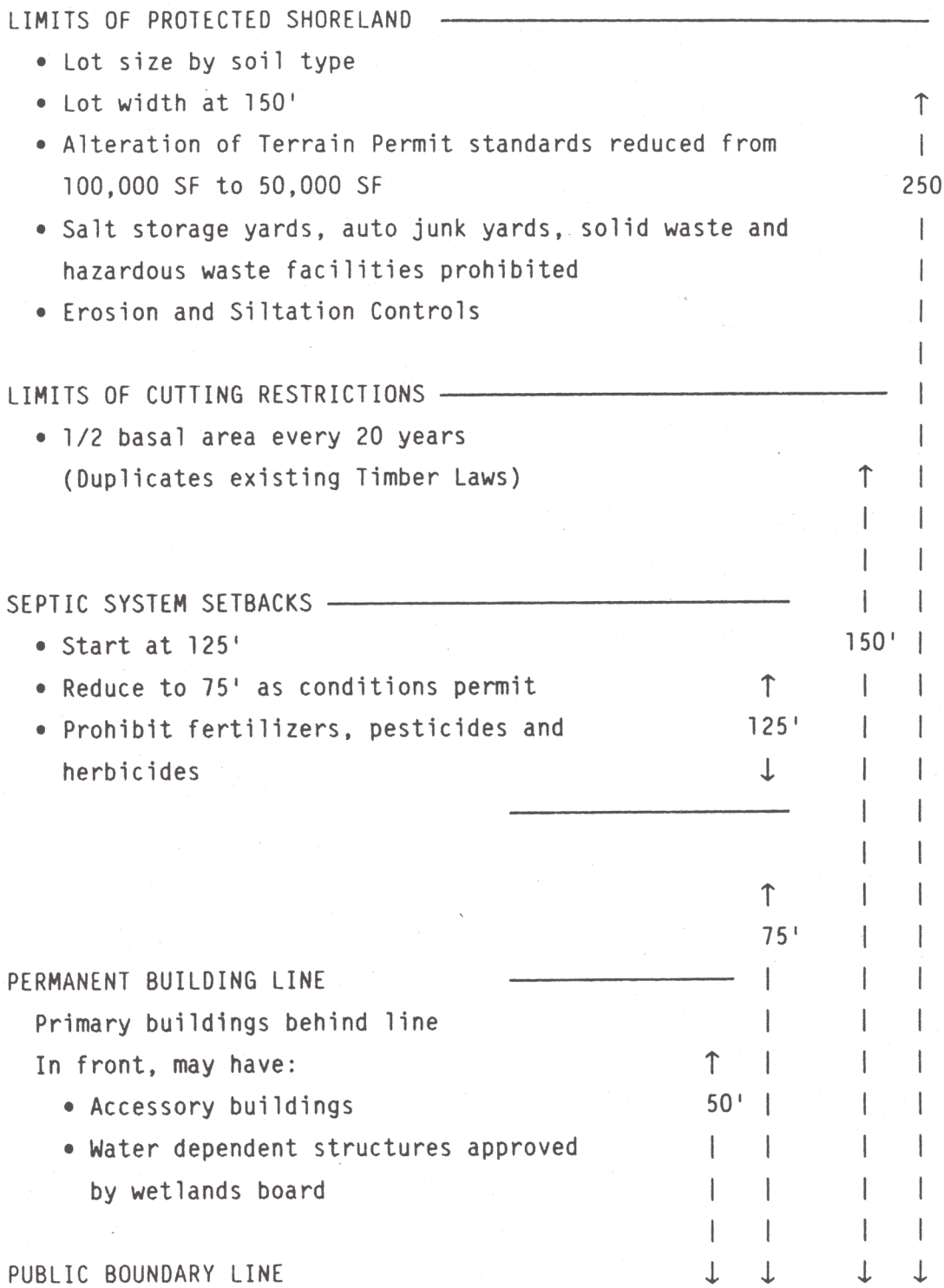
PERMANENT BUILDING LINE

Primary buildings behind line

In front, may have:

- Accessory buildings
- Water dependent structures approved by wetlands board

PUBLIC BOUNDARY LINE



- If the downgradient soil is a porous sand and gravel material with a percolation rate of more than two minutes per inch, the setback shall be at least 125 feet from the public boundary line;
- For soils with restrictive layers within 18 inches of the natural soil surface, the setback shall be at least 100 feet from the public boundary line; and
- For all other soil conditions, the setback shall be at least 75 feet from the public boundary line.
- All new structures within the protected shoreline shall be designed and constructed in accordance with the current rules of the department promulgated pursuant to RSA 485-A:17 for controlling erosion, siltation and phosphorus loading to public waters during and after construction.
- The minimum size for new lots in areas dependent upon on-site septic systems shall be determined by soil type lot size determinations, as set forth in the department's current administrative rules promulgated pursuant to RSA A 485-A.

c. Land Management and State Government

As we have stressed throughout this Chapter, the manner in which man uses the land and/or its resources within the watershed will play a major role in the maintenance or degradation of water quality standards. Each of the major categories of management practices is reviewed in the following sections and recommendations made relative to the proper application of each, along with a notation of applicable state laws which regulate the manner in which these practices are carried out.

i. Agriculture

A variety of management practices, implemented at individual farm sites, can reduce or eliminate the potential for adverse water quality impacts. These include:

- Manure Storage and Spreading - manure should be stored in a facility which reduces or eliminates the potential for runoff or leaching of nutrients into watercourses. Manure spreading should be conducted only when the ground is not frozen or wet. In those instances where plowing is anticipated, such action should commence as near to the date of spreading as possible.

- Land Clearing - in all instances where land areas are cleared for the purpose of providing additional cropland or pastureland, the clearing operation should be conducted in a manner which reduces the potential for erosion and sedimentation. (See Silvicultural Activities.)
- Alteration of drainage courses, pond construction and filling of wetlands - management practices designed to increase the amount of land utilized for cultivation, unless conducted in a manner acceptable to the appropriate state agencies and their established guidelines, can significantly affect the level of water quality within the watershed. Existing and altered drainage courses must be managed so that the potential for streambank erosion is eliminated. Strict guidelines relative to pond construction, which reduce or eliminate sedimentation and erosion during construction and eliminate the potential for dam failure or improper overflow during peak flow periods, should be followed. Wetlands and marsh areas, especially near stream systems, should be protected as a means of reducing flow velocities, thereby reducing erosion potential and dispersing and reducing sediments and nutrient loading.
- Access to running water - in all cases, direct access to running water (streams, rivers, etc.) by farm animals should be eliminated. Water supply to farm animals should be provided from a tank or alternate system which is located at a reasonable distance from all sources of surface water.
- Chemical Fertilization-Pesticide, Herbicide and Fungicide - in those instances where chemical fertilizers or pesticides are used, the application of such should be conducted in a manner which limits the potential for runoff and/or contamination of water systems. This can be achieved by tilling the soil immediately following the application of fertilizer and reducing the use of fertilizers and pesticides within a 125 foot distance of standing or running water.

Each of these recommended mangement practices relies almost entirely upon the individual landowner for compliance. Some will require capital outlays to achieve these goals. Financial assistance from U.S.D.A. agencies and educational programs directed toward landowners should be made available whenever possible. Existing state laws that govern specific agricultural practices are included in Table XI-5.

Table XI-5
State Laws Governing
Agricultural Practices

Revised Statute Annotate	Subject	Governing Agency
RSA 482-A	Dredge and Fill	DES, WRB
RSA 485-A:17	Significant alteration of the terrain	DES, WSPCD
RSA 224:44-a	Cutting near public water or highways	Forest and Lands
RSA 485-A:12-15	Limiting disposal of waste	DES, WMD
RSA 79:10	Notice of intent to cut	NH Dept. of Revenue
RSA 430:28-48	Pesticide control act	Pesticide Control Division
RSA 430:2848	Economic Poisons Act	Pesticide Control Division
RSA 431:33	Regulation of handling of Manure, Agricultural Compost and Chemical Fertilizers	Dept. of Agriculture

ii. Silvicultural Activities

Timber harvest and silviculture practices, if conducted in an improper manner, can contribute significantly to stream sediment and nutrient levels, thereby affecting the level of water quality within the watershed. The following management practices are recommended as a means of reducing adverse impacts from these activities.

- Road Construction - Properly designed skid roads, which do not exceed a gradient of 10% and incorporate the use of water bars for drainage puropses, substantially reduce the potential for erosion and sedimentation. In those instances where stream crossings are required, construction of a log bridge and proper attention to stream bank alteration should be implemented by the logger.
- Clear Cutting - In areas of thin soil cover or shallow to bedrock soil characteristics, clear cutting should be minimized to reduce the potential for erosion and nutrient release. In addition, in all areas in which clear cutting practices are conducted, a vegetation buffer area in excess of 100 feet should be maintained around all surface water areas.

State statutes which regulate silviculture practices and timber harvesting are included in Table XI-6.

iii. Construction Practices

Construction operations, whether it be a single family home or a major industrial expansion, can place a severe burden on water quality within the watershed unless closely monitored. Standard practices which reduce the level of erosion and sedimentation should be incorporated at all times. These practices can be enforced by the building inspector of the local municipality as well as by state officials to ensure conformity. These practices include:

- Building Permits - Included within a standard building permit application should be a provision which requires the contractor to incorporate management practices which reduce the potential for soil erosion and sedimentation. Nonconformity to these practices should result in the revocation of such a permit and the issuance of a cease and desist order.

Table XI-6
State Laws Governing
Silviculture Practices

Revised Statute Annotated	Subject	Governing Agency
RSA 224:44-a	Cutting near public water or highway	Forest and Lands
RSA 224:44-6	Care of slash or mill wastes	Forest and Lands
RSA 79:10	Notice of intent to cut	NH Dept. of Revenue
RSA 485-A:17	Significant alteration of the terrain	DES, WSPCD
RSA 482-A	Dredge and fill	DES, WRD

- Site Work - During actual construction, care should be taken to reduce erosion through such control measures as mulching of disturbed soils surfaces and excessive gradients, construction of sediment retention ponds in those instances where surface water is disrupted and phasing of construction when possible to reduce the gross land area which may be exposed or disturbed at any one point in time. Site preparation, such as clearing or grading, should be monitored and practices incorporated similar to those outlined under Timber Harvest and Silviculture Practices.

- Road Construction - Construction of new roadways and the alteration of existing roadways should be conducted so as to eliminate erosion problems. Roadway lane surfaces (dirt roads) and shoulders should be constructed so as to reduce erosion. Roadside gradients should be no more than 3:1 and mulched as soon after construction as possible. Proper drainage should be provided through use of appropriately designed culverts and ditching alongside roadways. Drainage should be designed such that stormwater runoff from roads and other impervious surfaces is minimal. Construct areas that allow for infiltration of the stormwater.

  The incorporation of these broad construction practices can produce substantial results. However, it cannot be left solely to the contractor to ensure the implementation of such practices. While local municipalities can enforce proper practices through the building permit program, assistance and support from the state is available through the enforcement of the statutes listed in Table XI-7.

iv. Lawn Fertilizers

The practice of lawn fertilization in areas adjacent to surface waters has the potential of increasing nutrient loading to the water. Regulation of this practice can be handled at the local or state level. The adoption of a Shoreland Protection District should include restricting such practices within 125 feet of any water surface. This sort of ordinance requires close monitoring by the local municipality during the spring and summer months.

Table XI-7

State Laws Governing Construction Practices

Revised Statute Annotated	Subject	Governing Agency
RSA 79:10	Notice of intent to cut	NH Dept. of Revenue
RSA 36:19-29 & 34	Local subdivision regulation	Municipality
RSA 485-A:29-35	Subdivision Regulations	DES, WSPCD
RSA 482-A:21	Excavation & dredging	DES, WRD
RSA 485-A:17	Significant alteration of the terrain	DES, WSPCD
RSA 224:44-a	Cutting near public water or highways	forest and lands

v. Gravel Pits

The location of gravel pits and the manner in which the material is removed from the site should be closely monitored by local officials. Gravel pits should not be permitted in any location where increased runoff will result in sedimentation of surface waters due to erosion. Where possible, inactive pits should be graded to reduce excessive slopes, thereby reducing the potential for runoff and sedimentation.

R.S.A. 155-E governs the excavation of earth. This law places the burden upon the landowner to obtain a permit from the municipality within which the proposed excavation is planned. In this manner control over excavation of material is retained by the municipality.

4. Watershed Management Summary

Development within the watershed which fails to take into account the carrying capacity of the land will serve to lessen the value of the these water bodies. Management of the watershed, which ensures the maintenance of adequate water quality standards and prevents future degradation of water quality, is of obvious importance to the local municipalities from both an economic and environmental standpoint.

Each of the recommended management practices outlined above will require incentives to ensure conformity to, and implementation of, these recommendations. Management practices are more difficult to monitor and enforce than regulatory controls and therefore require alternative means of implementation.

In order to provide for proper management, specific regulatory controls should be incorporated at the local level. Controls should include the determination of lot sizing according to the soil and slope characteristics, enforcement of shoreline setbacks and the control of seasonal cottage conversions to year round residences. Existing state laws lend support to the incorporation of these specific practices. Land management practices relative to agriculture, timber harvest, construction and gravel pit operation require more of a commitment by individual landowners and operators. Enforcement of specific regulations relative to management practices exists primarily at the state level. However, local municipal officials should play a major role in the identification and documentation of potential violations. Local

ordinances can be adopted which conform closely to existing state regulations. In this manner, local ordinances supplement state regulations and provide support for existing state laws. Each recommendation will involve some degree of personal sacrifice. However, this price is small in comparison to the economic, environmental and aesthetic values to be realized by a watershed with a high level of water quality.

While financial incentives to logging operations and construction firms are limited, educational programs designed to inform these operators can be implemented, thereby reducing their potential for costly delays due to time limitations.

Most other management practices require monitoring by local officials who can then notify state authorities when violations of state regulations are documented. This review by the municipal officials is the most effective manner in which these laws can be monitored and enforced.

Programs currently exist at the federal level, through the United States Department of Agriculture (U.S.D.A.) which provide for cost sharing of certain conservation projects. Educational methods can be incorporated by the Soil Conservation Service and can help to point out practices which benefit the farmer as well as reduce the potential for water quality degradation.

E. Artificial Phosphorus Abatement

Although no sanitary survey of septic systems was conducted around Mendums Pond, a key result of the leachfield study concluded that the surrounding soil types were inadequate for assimilating phosphorus. Many of the existing camps and year-round houses predate the 1967 subsurface rules and regulations, and have grandfathered septic systems. The upgrading of septic systems around the pond could occur in four ways:

1. voluntary replacement,
2. proven failure and subsequent order to replace from the health officer or the Subsurface Bureau,
3. conversion from seasonal to year-round use or addition of bedrooms, or
4. engineering study conducted prior to the house sale showing evidence that the septic system was in need of repairs or replacement.

Since the estimated impact of phosphorus from existing sanitary pollution of Mendums Pond is 19 percent of the total impact, it is reasonable to evaluate abatement alternatives.

1. Wastewater Treatment Alternatives

a. No Action

One option is to take no action to abate the identified and suspected pollution. The impact of this alternative could be an eventual degradation of the water quality of Mendums Pond.

Failed septic systems present a potential health hazard associated with the presence of untreated human wastes above ground and in surface waters. Groundwater contamination and subsequent pollution of drinking water is probable in many areas.

The leachfield study revealed that the surrounding soils of Mendums Pond are inadequate to uptake the phosphorus from leachfields. No action will result in the continued load of phosphorus to the pond.

b. Cluster Systems

A typical cluster treatment system includes a septic tank with subsurface leaching field. Several areas are designated as potential cluster groups based on the distribution of existing dwellings. Community septic systems are often utilized at mobile home parks and campgrounds. Cluster systems are quite expensive to build but are more cost-effective than building many individual septic systems.

c. Upgrading of Individual Systems

A wide range of individual treatment systems has been explored in the last few years due to a renewed interest in on-site disposal systems. The Federal Environmental Protection Agency has a thorough review system in their draft report "Innovative and Alternative Technology Assessment Manual." The fact sheets from that manual give a good outline of available alternatives. A discussion of many of these alternatives will follow.

i. Septic Tank and Leaching Field

Individual treatment systems installed in recent years normally consist of

a septic tank for solids separation and degradation, and a soil absorption system or leachfield to aid liquid percolation into the soil, as shown in Figure XI-1. The size of the tank is proportional to the expected usage and the leaching field is sized according to both usage and soil characteristics. When soils are poor (i.e., low permeability) or flows are high, the leaching field must be large. Problems arise when the required design of the field is impractical or impossible due to lot restrictions and/or soil and groundwater conditions.

ii. Compost Toilets

A reduction in the volume of wastewater entering the leaching field is possible by the use of a waterless toilet of the composting type. A discussion of this alernative requires an understanding of domestic wastewater composition. Wastewater is the by-product of all water used within the home including toilet facilities, cleaning, cooking and personal hygiene. The wastewater associated with toilet and urinal usage is considered concentrated human waste and classified as black water. Gray water comprises the remainder of the domestic wastewater such as water from baths, showers, sinks and clothes washers. By eliminating toilet and urinal usage (black water) about a 40% reduction in total flow can be achieved.

Compost toilets decompose human wastes by a natural biological process. With the aid of air and/or some heat, human waste will degrade itself over an extended period of time. This process is similar to the compost process in composting leaves and manure piles, used for garden and agricultural crop enrichment. Basically, there are two types of compost systems. One utilizes a large compost chamber that must be installed in the basement or underground, and is called an external unit. The larger external units rely completely on natural processes. They have no external heat addition or composting aids as in the smaller internal units. The internal units provide heat and compost aids (such as a starter bed or enzymes) to speed the degradation process, thereby decreasing the required volume. The treatment process is the same in each. Toilet wastes enter through a toilet chute and accumulate in the compost chamber. Here, with air supplied through ventilation, warm temperatures and humidity, the waste begins to decompose. The process should create no odor since released gases and water are removed by outside ventilation and evaporation. Organic material such as food wastes should be introduced into the chamber to aid in the composting process.

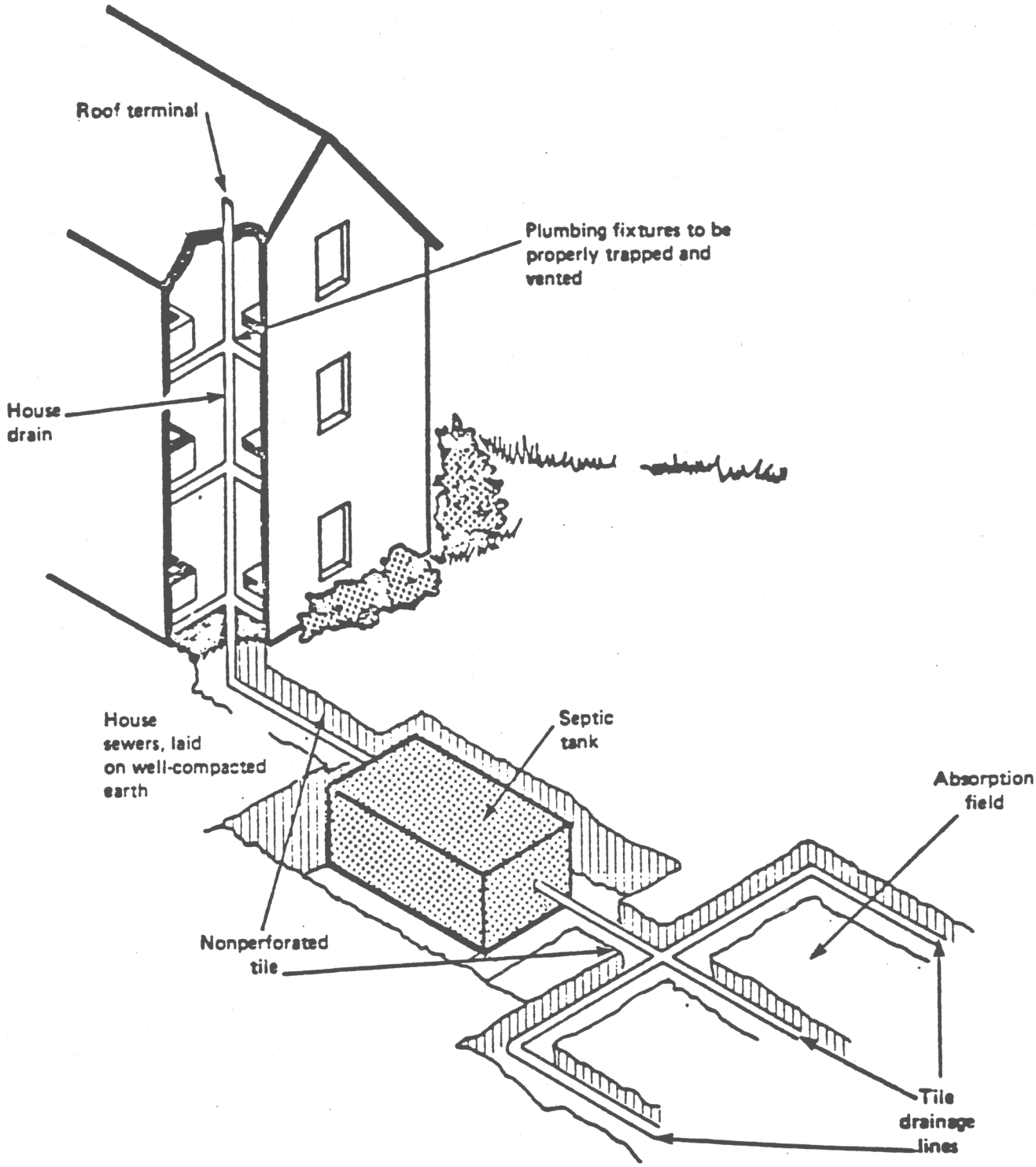


Figure XI-1 General Septic System Design

The total decomposition time ranges from 1-1/2 to 2 years initially, and from 3 to 12 months thereafter. At the end of this time, the wastes have been reduced to a rich, odorless humus that can be removed and used as garden soil. This is the only required maintenance except for the occasional addition of enzymes for certain internal units. For the internal units, electricity is required for heating and for a ventilation fan, while some external units utilize convection currents for ventilation. The amount of humus produced varies with the system and ranges from 15 to 60 pounds per year per person.

iii. Individual Treatment and Recycle

The recycle system is a self-contained, package treatment unit specifically designed to treat black water. Wastes are transported in about 2 quarts of water per flush, by means of vacuum, to the self-contained unit where the black water is treated by a combination of anaerobic and aerobic decomposition, settling, filtering, and purification by ultraviolet light. This treatment and purification process operates efficiently at temperatures between 55°F and 120°F, and must be protected against freezing. The recycled water is returned to a flush holding tank. The recycle toilet operates on 110 volts AC and consumes from 300 to 500 KWH of electricity per month of operation. The system requires regular maintenance. Since the recycle toilet uses cultured bacteria to accelerate digestion of solids, the bacteria must be added periodically in the form of dry packets. The water level should be checked every two weeks. Periodic replacement of some parts is required. Activated carbon, used in the filtering system, needs annual replacement as do the ultraviolet lamp bulb used in purification, the air filter cartridges on the vacuum and aeration pumps and the three-way solenoid valve regulating vacuum and aeration.

iv. Low Water Flush Toilets

Several low water flush toilets are available which utilize from one quart to two gallons of water instead of the average five to eight gallons used by a standard flush toilet. A limited capacity self-contained tank controls the volume of flushing water. Air in the tank is compressed as it is filled with water. When flushed, the compressed air forces the water through the toilet bowl at a faster rate, thereby requiring a lower volume to empty the bowl.

Other low water flush toilets involve mechanical equipment and use either vacuum or pressure to empty the toilet bowl. Basically, the components for a one toilet vacuum system are the toilet, vacuum pump, and plumbing. The vacuum pump maintains a vacuum in the plumbing at all times. A valve separates the toilet bowl and the plumbing. When activated, the valve opens allowing the contents of the toilet bowl to be drawn into the plumbing. These wastes remain under vacuum until they reach the holding or discharge tank. The maintenance required is minimal, but mechanical equipment is involved to maintain the pressure or vacuum. Although the water content is lowered, the amount of organics, solids, toxics, etc. is still the same as in the conventional flush toilet.

v. Gray Water Flow Reduction

Unlike concentrated human waste, gray water cannot be completely eliminated as domestic wastewater by recycling or composting. However, many devices are available for water conservation that greatly reduce gray water quantities. Flow restrictors and regulators can be placed on faucets and shower heads. The average person showering will use 6 gallons of water per minute for 7.5 minutes with a standard shower head. Should a 3-gallon per minute flow reduction be installed, an average family of four persons could save 90 gallons of water per day, assuming all took one shower a day.

Water conservation and wastewater treatment methods described above may result in significant flow reduction to the ultimate treatment and disposal system. Assuming the average family produced 75 gallons per day per person, an estimated flow for their household is about 300 gallons/day. Table XI-8 displays estimated resulting flows.

vi. Aerobic Wastewater Treatment Unit

Many alternative individual systems utilize an aerobic process. The operating principle of aerobic treatment units is the same as that used in many conventional municipal wastewater treatment plants of the activated sludge type. In essence, these household/on-site systems are miniature models of the larger municipal plants. Some units are complex while others are simply an aeration chamber.

This process of aeration and subsequent settling is called secondary treatment. It is a biological process that removes organics which cannot be

Table XI-8

HOUSEHOLD WASTEWATER FLOW QUANTITIES WITH WATER CONSERVATION AND SEPARATION

Item	Design Criteria	Percentage Flow Reduction	Reduced Wastewater Flow
1. Compost, incinerator or recycle toilet	Flow - 300 gpd for average dwelling	35%	195
2. Low water gravity flush toilet	" " " Limited to 3-1/2 gallons per cycle	7-1/2%	278
3. Low water vacuum flush toilet	" " " "	7-1/2%	278
4. Shower flow control device	Limited to 2 gpm	4%	288
5. Combination of 1 an 4 above		39%	183
6. Combination of 2 or 3 and 4		11-1/2%	266

settled out in primary treatment such as the septic tank. The incoming wastewater is initially treated in order to make it acceptable for aeration. This primary treatment is accomplished by various methods including settling of heavy solids, grinding of large particles or rough filtering. The wastewater then enters the aeration chamber where it undergoes aerobic decomposition. Solids formed by the aerobic degradation process are subsequently allowed to settle out in the settling chamber. After the settling chamber, the effluent is discharged to the ground. The end product, though better quality than septic tank effluent, does contain substantial amounts of pollutants which must be removed by the soil or discharged to a stream.

The biological secondary treatment process utilized in these units is a sensitive one. This, in addition to the mechanical equipment involved, requires that a unit be monitored and maintained on a continual basis. If this equipment is purchased, it is highly recommended that the home owner obtain a service contract with a reliable repair service and set up a schedule of maintenance calls (at least four times a year). Alarms can also be supplied which are wired into the house and activate when malfunctions occur.

vii. Raised Leach Field System

The raised leach field system can be an effective subsurface disposal method in areas of poor soils, high ground water or shallow depth to bedrock where a conventional leach field would be prone to failure. Treatment efficiency could be further increased by using an aerobic unit for primary treatment prior to a raised leach field, in lieu of the conventional septic tank as previously discussed. Oxygen is present in effluent from the aerobic tank which enhances degradation or solids and pollutants in the leach field. Additionally, the content of iron sulfide, which tends to clog the infiltrative surface of the leach bed, is less prevalent in the aerobic tank effluent. The reduced flows achieved by utilizing flow reduction devices and zero discharge toilets can greatly reduce the necessary infiltrative surface of the raised leach bed.

A raised system is an above the ground leaching bed, usually three feet from the ground surface to the washed stone bed. A diversion ditch should be used when raised systems are placed on moderate slopes. The mound system achieves wastewater degradation by percolation through topsoil, combined with

evapotranspiration via vegetation and wind. Topsoils are much more efficient media for bacterial decomposition than subsoils. A clay layer used on berms prevents lateral seepage of untreated effluent. In colder climates the evapotranspiration aspect of treatment is greatly hampered.

viii. Evapotranspiration Leach Field

Another alternative to the conventional leach field or trench system is the evapotranspiration leach field. If clay, hardpan, groundwater, or creviced solid rock is found wihin 4 feet of the ground surface, it may be possible to artificially build up an earth area for sewage disposal, provided at least 12 to 18 inches of natural earth exists. Evaporation from the ground surface in the Northeast has been found to average 6 to 10 inches of water per year, with two thirds of this amount taking place in the warmer months from April to September. Transpiration naturally occurs when vegetation is flourishing, with values being a function of the type of crop present. The following values have been established.

Item	Values
Grain and grass crops	9 to 10 inches
Deciduous trees	8 to 12 inches
Small brush	6 to 8 inches
Coniferous trees	4 to 6 inches

The total of transpiration and evaporation is referred to as the consumptive use, which is the main design criteria for this disposal method. As with the mound leach field which functions on percolation of wastewater through soils, the area required for the evapotranspiration process could be greatly reduced by using no discharge toilets and low flow fixtures. Proper functioning of the evapotranspiration bed is hindered in the Northeast. During winter months, the consumptive use of the bed is practically zero, with snow cover and freezing temperatures. Additionally, the bed should be installed on level ground, which is difficult to find in many areas.

ix. Wastewater Treatment Alternatives Summary

A variety of alternatives is possible for the upgrading of individual treatment systems. Each alternative has limitations for proper operation

including difficult climate, terrain, soils and/or ground water conditions, personal acceptance, technical and administrative problems.

A summary of advantages and disadvantages is shown in Table XI-9 for all alternatives previously discussed.

d. Septage Handling Alternatives

The alternatives of regional waste treatment with conventional or pressure collection systems will still require septage pumping from unsewered second and third tier houses on a routine basis every 2-3 years around Mendums Pond. In addition, the cluster system alternatives include large septic tanks that require pumping every other year.

One septage handling alternative would include pumping of the septage by a tank truck, owned and operated by a management district for Mendums Pond. Septage would be hauled to the nearest approved disposal site or wastewater treatment plant for further treatment. Hauling of raw septage to an existing wastewater treatment plant would only require the payment of a tipping fee. Presently, charges for septage disposal is around $.07 per gallon. Disposal at a land treatment site owned and operated by a town or district may be less costly once site development costs are provided for.

Another septage handling alternative would include contracting with a private septage hauler to periodically pump all septic tanks and be responsible for disposal. Contracting cost-estimates recently solicited from local private haulers averaged $.08 per gallon.

e. Environmental Assessment

The environmental effects for the various sanitary pollution abatement alternatives were evaluated. Potential environmental impacts may be summarized as follows:

i. Water Quality

The alternatives of regional and/or cluster treatment would meet present state and federal regulations regarding acceptable treatment levels of sewage. Any failed individual septic systems on Mendums Pond or its tributaries have a deleterious effect on the water quality and the aquatic habitat of the lake, and are a potential health hazard. Some of the beneficial effects of treatment on the aquatic habitat include increased dissolved oxygen content of the water because of a reduction of organic matter and phosphorus presently flowing into the lake.

TABLE XI-9

INDIVIDUAL INNOVATIVE/ALTERNATIVE TREATMENT SYSTEMS

TREATMENT METHOD	ADVANTAGES	DISADVANTAGES
1. Septic tank and field	Simple operation and maintenance. Good public acceptance.	Dependent on soil and site conditions - percolation rate, depth to ledge, seasonal high water level, distance to well or surface water.
2. Compost toilets	Eliminates blackwater flow	Gray water still requires septic tank and soil absorption system. Potential for breeding of flies, odors and hydraulic overload. Problem with public acceptance.
3. Individual treatment and recycle	Reduces flow from home.	Still requires septic tank and soil absorption system. High cost and high maintenance.
4. Low water flush	Reduces black water flows.	Concentration of organic loading still high. Gray water still requires treatment and disposal.
5. Gray water flow	Reduces volume of wastewater requiring treatment.	Concentration of organic loading still high. Treatment and disposal still required.
6. Aerobic treatment absorption bed	Achieves higher BOD removals than conventional septic tank systems.	Variable effluent quality; semiskilled operation and maintenance required. Requires conventional soil absorption system. Does not, in general, remove phosphorus.
7. Aerobic treatment surface discharge with disinfection	Achieves higher BOD removals than conventional septic tank systems. Avoids need of soil absorption system.	Variable effluent quality requires semiskilled O&M. Requires surface stream discharge. Does not, in general, remove phosphorus.

TABLE XI-9 (continued)

INDIVIDUAL INNOVATIVE/ALTERNATIVE TREATMENT SYSTEMS

TREATMENT METHOD	ADVANTAGES	DISADVANTAGES
8. Septic tank mound system.	Can be used in areas where depth to ledge or ground water is marginal.	Dependent on unusually poor percolation rate, depth to ledge, and seasonal high water level. Also dependent on distance to well or surface water.
9. Evapotranspiration leach field.	Does not rely on soil absorption process.	Limited by meteorologic and climatological conditions. Large land area requirements.

During construction of a selected alternative, the contractor will be required to provide a means to minimize both siltation and erosion. All appropriate areas of construction will be sufficiently seeded and mulched, upon completion, to prevent erosion. Where necessary, drainage swales and culverted trenches will direct surface runoff. Siltation basins will be used to intercept silt and eroded material before they enter any watercourses. Construction and implementation of the project should not appreciably affect the hydraulics of any stream.
Presently there is no municipal water supply for the lake. The private wells around the pond should not be affected by properly designed and constructed alternatives.

ii. Wetlands

All wetlands around Mendums Pond have been mapped. Although no significant environmental impact is expected, the alternatives considered do include collection systems that could pass through wetland areas. Adequate precautions will be required to minimize the primary impact of construction, with special emphasis on control of sedimentation and siltation due to erosion.

iii. Historical and Cultural Value

It is not anticipated that the proposed alternatives will affect areas designated as having historical or cultural value. Facilities proposed for collection and treatment would be constructed below ground level, with those areas of construction being returned essentially to their original state. If treatment facilities are to be constructed in previously undisturbed areas, an archaeological study would be required.

iv. Hydrologic Impacts

The hydrologic areas of concern include increased rates of runoff, transfer of water to another watershed, modification to the water table, and transportation of groundwater contaminants. Modification of any of these factors could adversely affect the hydrologic cycle. Increased runoff would be minimized by proper design and control during construction. If a subsurface treatment alternative is selected, a study of the transport of groundwater contaminants would be required. No other adverse impacts are anticipated.

v. Air Quality

There are no anticipated problems that would arise from the operation of the alternatives, relative to air quality. Any pumping stations will be completely enclosed below ground with only a hatch for access. Any odors that may occur would only be detectable in the immediate vicinity of the pumps during maintenance.

vi. Noise

The only noise generated by the alternatives would be from pumping units. Since the pumps are located below ground in the pump station enclosure, little or no noise will be discernible outside. During construction, noise will be generated by a variety of equipment used to excavate, grade and backfill. Construction noise is, for the most part, unavoidable. It will be necessary for the contractor to comply with existing regulations to minimize noise by employing mufflers and other devices that limit noise levels.

vii. Secondary Effects

It is not anticipated that secondary effects induced by the proposed alternatives will be significant. The proposed alternatives will service all problem areas of existing development around the lake. Implementation of watershed management techniques will help to mitigate the decline in water quality and potential secondary effects. Management techniques include a variety of land-use and land-managment practices, involving regulatory controls and management practices.

viii. Flood Sensitivity

No adverse environmental effects are anticipated in flood sensitive areas, since the proposed alternatives do not include structures or subsurface treatment facilities located in floodplain areas. Regulatory controls should be adopted at the local level to include a floodplain district for protection of the land area's natural ability to dissipate and stop flood waters.
The environmental effects of the pollution abatement alternatives are summarized on Table XI-10.

F. Recommendation Summary

1. Shoreland Protection

The Town of Barrington should adopt a strict Shoreland Protection Ordinance similar to the one proposed earlier in this chapter. The ordinance should focus attention on the protection of Barrington's lake watersheds.

2. Education

The Town of Barrington and the Mendums Pond Association should initiate an education program aimed at educating lake residents, transient lake recreationists and private/public beach users.

The use of the local media to provide tips on lake protection can be a valuable source of information. Signs posted at public beaches and launches help educate the transient users on things they should not be doing while

TABLE XI-10

ENVIRONMENTAL ASSESSMENT OF ALTERNATIVES

Alternative	Adverse Environmental Effects*	Beneficial Environmental Effects	Reasons Why Alternative is Desirable	Reasons Why Alternative is Undesirable
Cluster Systems	Possible ground water contamination	Abates present pollution	Low maintenance system	Relatively large land requirements, limited service area
Upgrading	Possible ground water contamination	No major benefit	No significant	High capital and/or operational costs; short-range solution
Septage Disposal by Contractor	No significant	Proper treatment at existing facility	Least costly, most convenient	No significant

*Each could encourage additional development.

utilizing the waterbody. The following list describes many of the Do's and Don'ts that lake users should be aware of:

Given a choice and a better understanding of the consequences of their actions, most people will opt to improve their environment. If all residents of the Mendums Pond watershed could enjoy the benefits of a choice recreational facility, they would likely take a greater interest in protecting water quality.

Additional practices of maintaining or increasing property values must also be considered (Flanders, 1986). The following is a list of practices that property owners should follow to help protect lake water quality.

a. Septic system maintenance should include pumping of the septic tank every two to three years.

b. Lawn fertilization has the potential to create excessive nutrient runoff to drainages and the ponds directly. The use of such fertilizers should be limited near any surface waters. Education of the public to the deleterious effects of fertilizers is recommended.

c. The use of non-phosphorus based detergents for home laundry is one of the most cost effective phosphorus reduction measures available. Some studies have estimated a 40 percent reduction of septic system phosphorus loading. The House and Senate could pass legislation during the 1992 session that will ban certain phosphate products.

d. Leaf control is important in reducing the phosphorus load to a waterbody. All leaf and grass dumping or burning on the banks of the lake should be eliminated. The removal of vegetative material to an area away from the lake will reduce the phosphorus source.

e. Land clearing should be kept to a minimum and bare areas should be revegetated to minimize erosion into the waterbody. Maintain a buffer zone of natural vegetation along the shore to contain erosion and assimilate phosphorus.

f. Do not bathe, shampoo, or wash anything in the lake with soap or any detergent.

g. Do not urinate or defecate in the lake or pond, and don't allow domestic animals to do the same. Animals should not be housed near the lake where the phosphorus in their manure can be washed into the lake by runoff.

h. Waterfowl management should be practiced at Mendums Pond. Enough natural food substances exist around lakes and ponds to feed duck and geese populations. Property owners should discourage the feeding of waterfowl. Studies have shown that duck and goose excrement is very high in phosphorus and nitrogen concentrations.

3. Subsurface Systems

An annual septic tank pumping program for Mendums Pond should be initiated through the Lake Association and Town Health Officer. Concerned lake residents may volunteer for this worthwhile program. Records of those participating in the program and dates of pumping should be updated each year.

A septic system inspection program for lake residents as well as those who live on tributaries to the pond should also be initiated. A rotating three year inspection program will prompt those who have inadequate systems to get them replaced.

RSA 485-A Revised Statutes Annotated of the State of New Hampshire, is specifically intended to prevent pollution of surface water by "inadequate sewage or waste disposal systems". Under the power of this chapter, the New Hampshire Water Supply and Pollution Control Division regulates the design standards and construction of subsurface disposal systems. Generally, local ordinances in the Mendums Pond watershed conform to the state regulations. Regardless of state approval, the Planning Board should state that it may require changes and additions to a proposed sewage disposal system. Most town health officers, through the power of the Planning Board, may issue a cease and desist order if the system becomes non-functional. The Town of Barrington may want to consider local regulations concerning septic system approvals that would allow the town additional control in several areas. Building permits for home additions and home conversions from seasonal to permanent use are now covered under state law.

Of particular concern at Mendums Pond is the large proportion of seasonal residences in the lake shore area. Sewage disposal systems which may be adequate for temporary use are often overloaded when conversion of a residence to year-round use occurs.

Effective January, 1989, RSA 485-A, requires landowners of all developed property to obtain state approval to increase the load on a sewage disposal system. RSA 485-A states that prior to expanding any structure or occupying any existing structure on a full time basis, which would increase the load on a sewage disposal system, the owner of such structure shall submit an application for approval of the sewage system to the Water Supply and Pollution Control Division.

The state also requires a site assessment study on all pending property sales of waterfrontage on Great Ponds. RSA 485-A states that prior to

offering for sale any developed waterfront property using a sewage system, the owner of the property shall, at his expense, engage a licensed sewage disposal system designer to perform a site assessment study to determine if the site meets the current standards for sewage disposal systems established by the Division. This law protects potential waterfront property owners from purchasing inadequate and outdated septic systems.

An amendment to Barrington zoning bylaws should define seasonal and permanent use and should alert residents to state law RSA 485-A. These laws should help the Zoning and Planning Boards regulate lake shore and other conversions. The latter restrictions are particularly appropriate since they provide some control over existing sewage disposal systems.

Although not always specifically designed for protection of surface and groundwater quality, zoning bylaws concerning lot sizes may influence local water quality, particularly where on-site subsurface disposal systems are used. Most pertinent to the water quality of Mendums Pond are the lot size requirements for land surrounding the ponds.

4. Volunteer Monitoring

Volunteer Monitoring should be continued on an annual basis for Mendums Pond. It is important to continue gathering chemical and biological data and defining long term trends. It will also be interesting to determine lake quality trends if lake development continues.

5. Education and Best Management Practices for Hobby Farms

An educational program should be made available on BMP's for those people in the watershed who practice animal husbandry or manage "hobby farms".

Hobby farms, with one or more animals, may have poor grazing practices, too many animals per acre, unrestricted access to streams, poor waste management practices and poorly drained soils. Such farms have limited space and capital with which to construct facilities for animal management. They have not traditionally been eligible for cost-sharing grants from federal or state programs.

Since small farms contribute to non-point sources of phosphorus and may even contribute more phosphorus than larger farms that practice BMP's, an educational program is needed on BMP's for waste and pasture management.

6. Best Management Practices for Silviculture

Silviculture activities in the Mendums Pond watershed must be strictly enforced and regulated. Frequent inspections of silviculture activities may detect a future water quality problem before it is too late for remedial action.

Forests or abandoned fields are the most common type of land use cover in the Mendums Pond watershed. As such, there is potential for future water quality impacts due to silvicultural and agricultural activities. Performance standards and plan review for silvicultural activities are regulated by the state through timber harvesting and water quality protection laws. Regulation prohibits the placement of slash and mill waste in or near waterways, and limits clear-cutting near great ponds and streams. These requirements may mitigate to some degree the water quality impacts associated with timber harvesting. More stringent local regulations could require buffer strips (uncut areas) of twenty feet between harvested areas and waterways in the Mendums Pond drainage, and increase the setback requirements for disposal of slash.

A major cause of water quality degradation associated with forestry activities is soil erosion caused or aggravated by logging and skidder roads. Disruption of the vegetative cover, disturbance by heavy equipment, and the often steep slopes on which cutting is carried out, combine to create conditions favoring rapid and severe erosion. Where access to harvest areas involves crossing a waterway, eroded material can rapidly impact downstream waterbodies. The New Hampshire Water Supply and Pollution Control Division responds to complaints of poor logging practices that impact water quality. However, the development of local forestry bylaws, under the administration of the Conservation Commission or Planning Board, would provide additional protection to the water resources in the Town of Barrington. In addition to the above recommendations, minimum requirements for erosion control and, perhaps, reestablishment of vegetation would be warranted.

7. Restricted and Permitted Land Use

Land use regulation is an alternative commonly recommended as a supplement to other watershed and in-lake management measures for control of eutrophication. A number of state and local regulations concerning land use

activities are intended to protect surface and groundwater quality, or indirectly serve that function in addition to their intended purpose. Several factors must be weighed when considering a nutrient source control program which is based upon local regulation. To be effective, a control measure should meet three conditions. First, it must be aimed at sources which are controllable. Second, it must be workable and enforceable through the jurisdictional framework within which it is to be implemented. Third, it must be flexible enough to accomodate innovative development options or feasible engineering alternatives while discouraging other, perhaps deleterious, land use forms. Land use regulations typically serve to modify or limit non-point sources of pollutants in a watershed. Thus, the impact of existing regulations, or the effect of implementing new regulations, cannot be adequately determined.

Much of these land use regulations should be included in the shoreland protection ordinance.

a. Restricted Uses

Some land uses, by their nature, pose a threat to water quality by introducing or concentrating potential pollutants in the watershed.

Other uses such as sawmills, auto repair garages, riding stables, and storage and disposal of solid waste should be assessed. Surface stormwater drainage for subdivisions should not be allowed to drain directly into a waterbody. Any development should treat stormwater runoff in a way which is deemed acceptable by the Water Supply and Pollution Control Division. In granting exceptions for such uses, or others which could threaten ground or surface water quality, the Board of Adjustment should consider professional advisement on setting conditions and safeguards for water quality protection. Indirect restrictions of some land uses should be provided by the Barrington zoning bylaws, by listing only the uses permitted for each district.

b. Permitted Uses

The most effective method of guarding against negative water quality due to permitted uses is the setting of specific performance standards for certain activities. In the Mendums Pond watershed, the most pertinent land use activities may be forestry, agriculture, earth removal, and subdivision development. We have discussed in great detail that earth removal should be

monitored and inspected on a frequent basis to guard against erosion of materials into any waterbody. Such activities are also governed by state statutes concerning earth removal: RSA-45-A:17 requires permits for construction, earth moving or other significant alteration of the terrain.

Subdivision regulations for Barrington should require that due regard be given the protection of brooks, streams and other waterbodies. Required improvements for subdivision developments should include stormwater drainage systems which assure minimal changes in the quantity and quality of runoff. An additional recommendation would be to require that comprehensive soil erosion and sedimentation control plans are part of each subdivision filing.

8. Stormwater Runoff Management

The stormwater runoff plan for all roads surrounding Mendums Pond should be examined. Town engineers should map out all direct discharges of stormwater runoff into Mendums Pond. A best management plan should be designed to treat or reduce the chemical pollutants that enter a lake via stormwater runoff. Matching funds may be available to install swales, retention basins or to incorporate other means of stormwater control.

G. Project Schedule and Monitoring Program

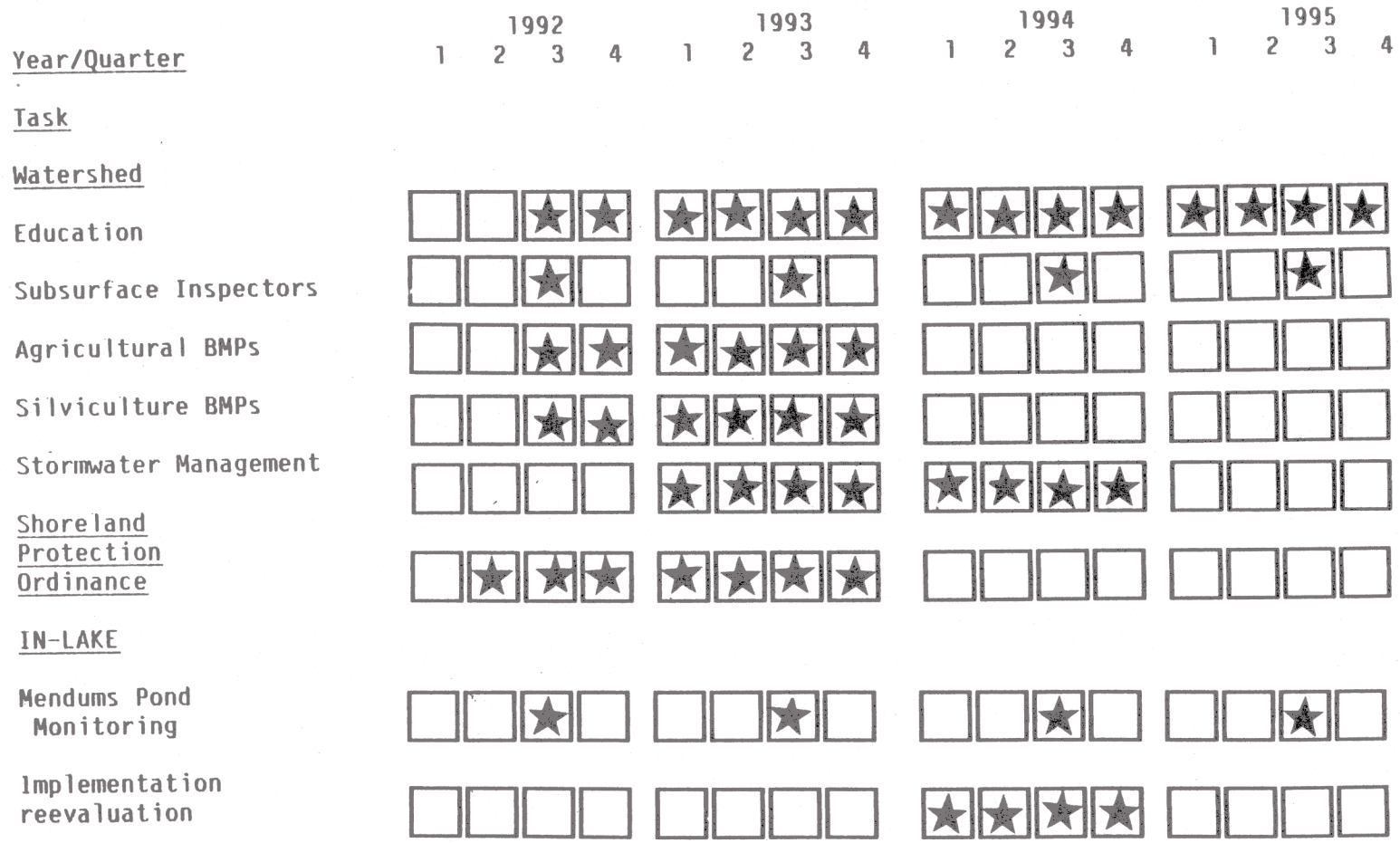
Watershed management, education, shoreland protection, best management practices enforcement and monitoring comprise the basis for Mendums Pond protection program. Table XI-11 provides a suggested and preliminary project implementation schedule.

The extent to which the protection strategies developed for the Mendums Pond watershed are eventually implemented will largely be dependent on new development progress in decreasing the non-point sources of phosphorus, the lake quality trends of Mendums Pond and the availability of local, state and federal funds.

The Town of Barrington can begin work on setting up a shoreland protection ordinance immediately. Educational and Best Management Programs can begin in the near future.

Monitoring programs at Mendums Pond should be scheduled to proceed in June of 1992. Septic system pumping programs and inspections can also begin during the summer of 1992 and continue each year.

TABLE XI-11 Project Implementation Schedule



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